DIVISION OF RESEARCH AND INNOVATION

I-TEAM BRIEF

The Innovation Team (I-Team) at the Caltrans Division of Research and Innovation, in cooperation with its partners, develops proven, ready-to-deploy innovations in methods, materials, and technologies that enable Caltrans to provide the most effective management of public services, resources, and infrastructure.

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Warm Mix Asphalt

Save energy, improve worker safety, improve production conditions

Hot mix asphalt production has many adverse consequences, including high energy consumption to maintain workable temperatures, and hazardous asphalt fumes that endanger workers at the plant and during construction. Asphalt-mix producers seek energy-efficient, environmentally friendly, and worker–friendly methods. Additionally, highway agencies need ways to improve upon the limits of hot mix asphalt, including improving mix compaction, extending the construction season, and permitting longer haul distances. ***The Caltrans I-Team strongly recommends the use of warm-mix asphalt (WMA) on paving projects throughout California because of its many proven improvements over hot-mix asphalt (HMA).***

READY TO DEPLOY

WMA technology, in use in Europe since 1995, allows the mixing and placement of asphalt mix at temperatures significantly lower than those used with conventional HMA. WMA technologies reduce the viscosity of the asphalt mix and provide complete aggregate coating at temperatures of 35 to 100°F (20 to 55°C) lower than HMA.

NEW AND IMPROVED

- Conserves fuel.
- Lowers emissions of volatile organic compounds, carbon monoxide, carbon dioxide, nitrogen oxides, and particulates.
- Reduces workers exposure to asphalt fumes at the plant and during construction.
- Improves workability of WMA at lower temperatures, resulting in easier raking and better compaction of the mix.
- Better compaction leads to higher in-place density, which reduces permeability and binder hardening due to aging, resulting in improved performance in terms of cracking resistance and moisture sensitivity.
- Paving can be completed with WMA under cooler conditions than those associated with HMA, allowing for an extended paving season, longer haul distance tolerance, and night paving operations.
- Additional benefits include the elimination bumps when paving over rubber crack sealant, improved workability of the polymer modified mixes, improved joint construction, and the ability to use greater amounts of reclaimed asphalt pavement.

WMA improves worker conditions.

About Warm Mix Asphalt

Warm-mix asphalt technologies have been in use in Europe for about 15 years. Given research and review-team findings on the extensive benefits of WMA technology over conventional HMA and the lack significant drawbacks, Caltrans strongly recommends the use of WMA throughout the state.

GET STARTED

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For a detailed comparison of suppliers, see the *Pavement Technology Update* article listed under "Learn More."

Learn More

- This I-Team Brief is a summary of "Warm Mix Asphalt Hits the Road," by Larry Santucci, PE., an article from *Pavement Technology Update,* a supplement to the *Technology Transfer* newsletter from the Institute of Transportation Studies at the University of California, Berkeley. http://techtransfer.berkeley.edu/pavetech/prc_update_vol2_no1.pdf

- FHWA Report: "Warm-Mix Asphalt: European Practice": http://www.tinyurl.com/fhwa-warmmix

- Caltrans-sponsored research: "Warm-Mix Asphalt Study: Test Track Construction and First-Level Analysis of Phase 1 HVS and Laboratory Testing" http://tinyurl.com/27av5fw

Caltrans I-TEAM BRIEF

SUCCESSES

- One of five technologies selected for the FHWA's Every Day Counts "Accelerated Technology and Innovation Deployment" initiative.
- In 2007, a team of 13 asphalt paving technologists evaluated WMA in four European countries and concluded there are no long-term barriers to WMA use and encouraged the adoption of the WMA in the U.S. The team included representatives from American association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA), the National Asphalt Paving Association (NAPA) the Asphalt Institute, asphalt suppliers, and HMA contractors.
- As of January 2010, at least 43 states had constructed trial sections using various WMA technologies.

METRICS

- Burner fuel savings of 20 to 35% are possible.
- Dust emission can be reduced by as much as 90%.
- Production temperatures can be reduced by up to 100°F lower than HMA.

Specific fuel, emissions, and other metrics based on testing completed on various technologies are listed in the *Pavement Technology Update* source article below under "Learn More."

GET READY

The 2007 review team recommended that WMA should be an acceptable alternative to HMA at the contractor's discretion if the WMA meets applicable HMA standards.

There are currently at least 20 competing WMA technologies on the market. See Table 1, below.

TABLE 1 WMA Technologies

Product / Process	Website	Supplier
Wax Additives		
Asphaltan B	www.romonta.de	Romonta GmbH (Germany)
Sasobit	www.sasobit.com	Sasol Wax (South Africa)
Chemical Modifiers		
CECABASE RT	www.cecachemicals.com	Arkema Group (France)
Evotherm	www.evotherm.com	MeadWestvaco Asphalt Innovations (USA)
Rediset WMX	www.surfactants.akzonobel.com	Akzo Nobel N.V. (The Netherlands)
Foaming Processes		
Advera WMA	www.adverawma.com	PQ Corporation (USA)
AQUABlack	www.maxamequipment.com	Maxam Equipment, Inc. (USA)
Aspha-Min	www.aspha-min.com	Eurovia Services GmbH (Germany)
Double Barrel Green	www.astecindustries.com	Astec Industries (USA)
Low Emission Asphalt (LEA)	www.lowemissionasphalt.com	Suit-Kote (McConnaughhay) Corporation (USA)
Terex WMA	www.terexrb.com	Terex Corporation (USA)
Ultrafoam GX	www.gencorgreenmachine.com	Gencor Industries, Inc. (USA)
WAM-Foam	www.shell.com/bitumen	Shell International (UK)/ Kolo-Veidekke (Norway)